"I can safely

no one underst

Quantum Mec

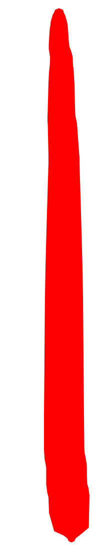
F

Young's Dou

Slit ex

Expt 1

Bullets

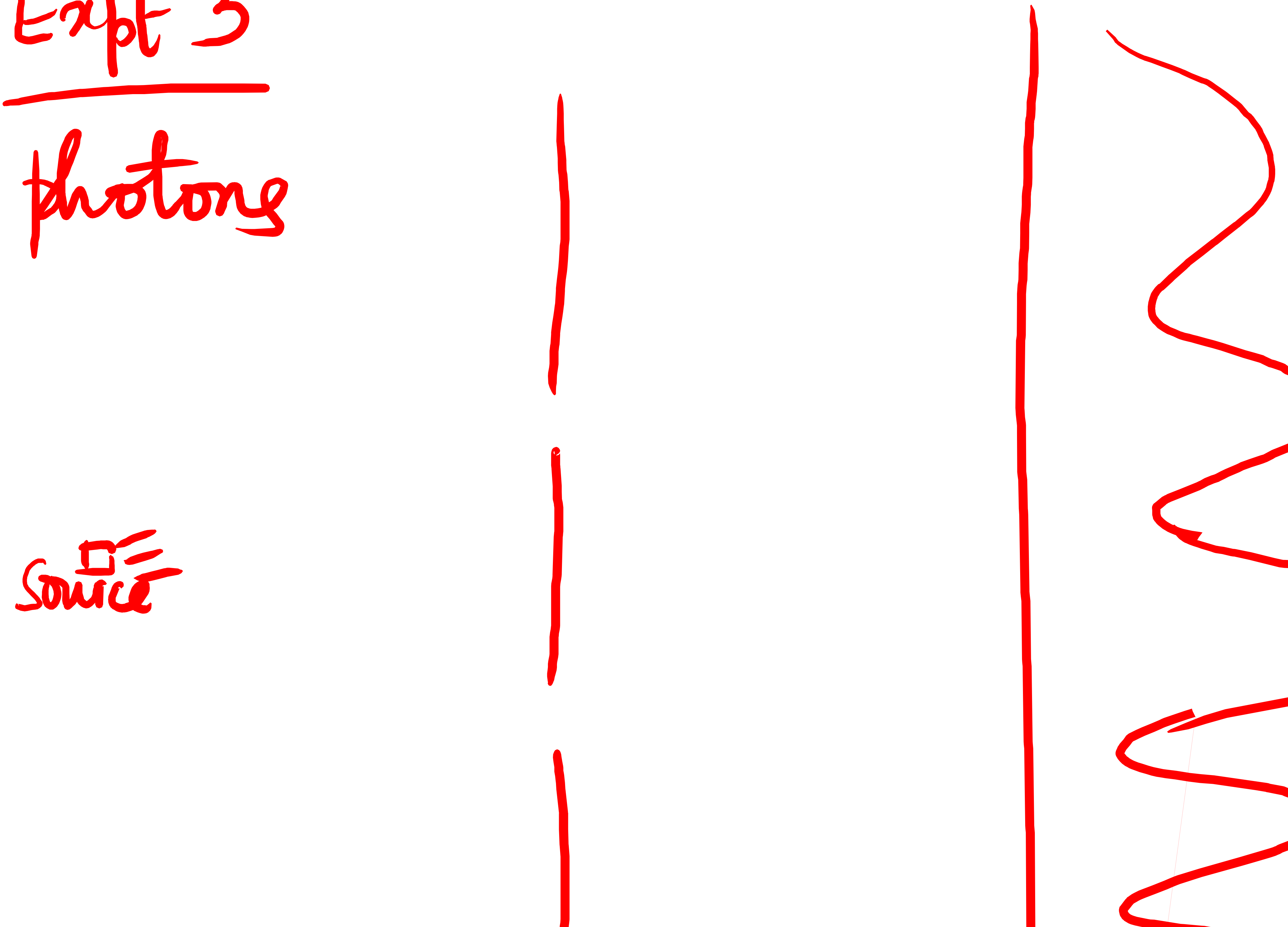


<u>Expt 2</u>

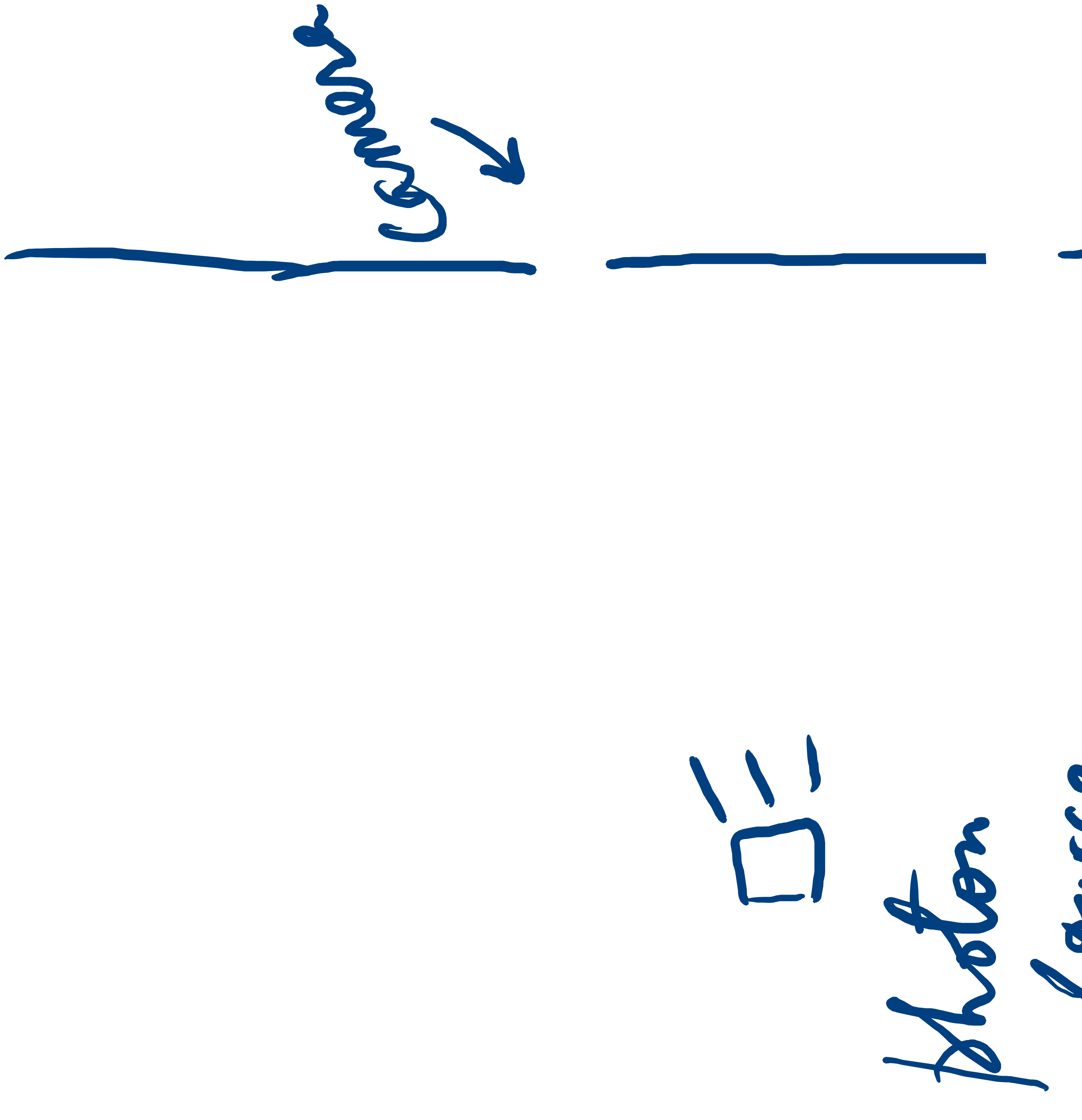
Water waves

Expt 3

photons



		Observ
Bullets	Discrete	Probabilit
Water waves	Continuous	Intensity
Photons	Discrete	Probability


photon

State of a quantum

$|\psi\rangle$ = vector i

ket notation

$\langle 1| = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\langle 0| = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$$\begin{matrix} p & & q \\ \vdots & & \vdots \\ \vee & & \vee \\ \begin{bmatrix} 1 \\ 0 \end{bmatrix} & , & \begin{bmatrix} 0 \\ 1 \end{bmatrix} \end{matrix}$$

Basis

Any vector in a vec

"<u>basis elements</u>"

$$\{ |0\rangle, |1\rangle \}$$

Complex vector space

$$\begin{bmatrix} a \leftarrow \\ b \leftarrow \end{bmatrix}$$

$a, b \in$

a, b are

$\begin{bmatrix} 2 \\ \end{bmatrix}$ $\begin{pmatrix} a \\ \end{pmatrix} \in \mathbb{C}^2$

We'll describe
state of a
using vectors
to an approf

BIT	QUB
2	2
0, 1	$\|0>$
scalars	vectors

Postulates of QM

1) State of a qua

– vectors "s

belonging to

2) Evolution

$|\psi(t_1)\rangle \quad , \quad |\psi($

$|\psi(t_2)\rangle = U \, |\psi($

$\left[\quad \right] = \left[\quad \right] \left[\right.$

3) Measurement

$$|\psi\rangle = a|0\rangle + b|1$$

"Measure" "what

Measure in the "$|0\rangle, |1\rangle$

$$|\psi\rangle = a|0\rangle + b|1\rangle$$

$|a|^2$ $\qquad$ $|b|^2$

$$|\psi\rangle = a|0'\rangle + b|1'\rangle$$

$$|0'\rangle \neq \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$|1'\rangle \neq \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$\xrightarrow{|a|^2} |0'\rangle$$

$$\{ |0'\rangle \quad |1'\rangle$$

$$|\psi\rangle = \frac{a}{\sqrt{2}}\begin{bmatrix} 1 \\ 1 \end{bmatrix} + \frac{b}{\sqrt{2}}$$

$$|0'\rangle = \frac{1}{\sqrt{2}}\begin{pmatrix} 1 \\ 1 \end{pmatrix} \qquad |1'$$

Q. Check that any vector

can be describe

$$|0\rangle = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \qquad |1\rangle$$

orthogonality

$$\left(|0\rangle \right.$$

inner product

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$|0'\rangle = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \qquad 1$$

$$|\psi\rangle = a\,|0'\rangle + b$$

Measure in the $|0\rangle$

$$+\langle 0| \left(\qquad \right) =$$

$$+ \left[\frac{\sqrt{2}}{\langle 1| + \langle 0|} \right] b =$$

$$1| a + \langle 0| b = \langle +|$$